Analysis of Emotional Tones in Top Hit Song Lyrics

in Relation to Economic Cycles from 1990-2010

Honors Undergraduate Thesis

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By

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Undergraduate Degree in Business Administration with an Operations & Logistics Specialization

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Abstract

While music preferences in society have always changed throughout the decades, we recognize that various external factors and trends—including the economic environment--affect the type of music we listen to. To this end, we seek to explore the relationship between economic measures and musical preferences in order to better understand how our external environment can affect the emotions that we choose to express and consume. This research analyzes the ways in how economic conditions (expansionary or contractionary periods) can be related to the tone of music that we listen to (such as joy, anger, and sadness). In this analysis, I found that in times of economic contractions, song lyrics were more likely to exhibit analytical and confidence tones, while in economic expansions' lyrics tend to show more tones of sadness and anger. In understanding how something as external as economic cycles can influence something as internal as musical preferences, we can continue to seek out how our microenvironment affects our microenvironment. While this research can have practical application (such as providing insight to the music industry for forecasting musical preferences), I believe, more importantly, that this research can help society uncover and contemplate how their external environment influences and shapes their preferences, beliefs, and identity across generations.

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Acknowledgements

I would like to give a special thank you to my content advisor, Dr. Hyunwoo Park, for his time, effort, and other contributions made throughout this research process.

I would also like to recognize Dean Elliot Bendoly and Dr. Roger Bailey for their guidance and support that have heavily shaped my understanding of and the success of my research.

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Introduction

It should come off as no surprise that an individual's personality, preferences, and identity are largely shaped by the environment they are surrounded in. From life-changing decisions to trivial preferences, most of our society acknowledges that our surroundings and circumstances play a large part of who we are and what we like. And while the external environment can include geographical location and the communities that one is in, it can also include larger forces such as the economic cycle.

We know to be true that the economic cycle can affect society through unemployment rates and consumer confidence. And more likely than not, economic conditions can influence our perspectives, preferences, and decisions. If our environment impacts our decisions and preferences, we can also make the connection that economic cycles can play a part in music we listen to. While music preferences in society have always changed throughout the decades, we recognize that various external factors and trends affect the type of music we listen to. But little to no research has been done to see the effects of the economy on our musical preferences.

Thus, for this research I proposed to analyze the relationship between economic cycles (contractions and expansions) and societal musical preferences in the United States. More specifically, I hope to explore how economic conditions can be correlated to the tones in music—whether it be sadness, anger, fear, or confidence. In revealing the relationship between economic cycles and societal music preferences, I believe that there can be greater discussion and awareness on how the emotions that people express and choose to consume are affected by their external environment and economic wellbeing. Additionally, we can think more

critically on how our environment affects the conscious or subconscious choices that we make—whether it be in music tastes or something more.

Literature Review

As there are few research dealing with the relationship between music preferences and the economy, most of this section will be dedicated to past works of research that have considered music, culture, and the economy. Despite the research being different than what we have proposed, there are still some useful insights and knowledge, as well as interesting facts, to gain from reading past research.

The first research article, “Music preference in adulthood: Why do we like the music we do?” comes from the U.K., written by Alink E. Greasley and Alexandra M. Lamont. For Greasley’s and Lamont’s research, they proposed to understand the individual’s engagement to music and understand what characteristics make them preference the music. In relationship to my current research, this article proves to be interesting as they relate music to an individual’s preference, whereas I will be relating music preferences to the external environment. Despite this difference, however, their ability to show that preferences do change over time can be related to my own research. After all, if preferences did not change throughout time, little difference would be seen between popular music during recessions and contractions. Thus, Greasley and Lamont reveals that it may be worthwhile to look into why preferences have changed over time—more specifically relating to the economic cycle.

Another research article, “Does Culture Affect Economic Outcomes?” written by Liuigi Guiso, Paola Sapienza, and Luigi Zingales, seems more relevant to my own research, as they consider the effects of culture—such as ethnicity—on impacting the economy. While my own research looks at music preferences instead of culture that can be passed down, it is interesting to note how they are able to relate culture with the economy. Additionally, it brings up another

important question to my research—is it culture that affects the economy, or the economy that affects culture? Whatever the answer may be, Guiso, Sapienza, and Zingales stresses the importance of understanding how culture and economy relate, which is what I intend to do in my work.

A third research article written by Raymond Fisman, Pamela, Jakiela, and Shachar Kariv, "How Did the Great Recession Impact Social Preferences?" considers the effects that the recession had to individual's selfishness and equality-efficiency tradeoffs. Through their research, they found that people's preferences for selfishness and efficiency over equality changed. Thus, they prove that the economy does have impact on individual's characteristics. In relating to my own research, I hope to see if the economic cycle can have an impact on musical preferences too.

One article that I found relevant to my research was "50 Years of Pop Music", written by Kaylin Pavlik. Pavlik, looked at and analyzed Billboard 1 music in the past 50 years. She analyzed lyrics, artists, song length, and more to gain a robust picture of how music changed over the years. While Pavlik did not use her analysis to relate to the economy or other external factors, I believe my research could benefit greatly from learning the methodology behind her analysis.

Finally, one last article, "How music has responded to a decade of economic inequality," explores the relationship between music and the economy. It reveals that there seems to be a relationship between the music we listen to and our economic reality. However, rather than singing songs about recessions, what became popular were songs about wealth. This is unsurprisingly, however, as "Popular music, of course, becomes popular partly because it takes people away from their lives" (Timberg). This article is one of the few that relates popular music

to the economy. And while they only look at the past decade of music, some of their findings are applicable to my own.

All in all, few research have looked into the topic that I proposed to study—the relationship between music and the economy. Despite this limitation, however, many research and resources are available to suggest that my research may be worthwhile to consider.

Hypotheses

This research will center around finding how economic cycles can impact the type of music that we listen to—more specifically in tone and word count. In analyzing contractual periods against expansionary periods, I hope to find that the songs popular during contractual periods have characteristics that set it apart from songs popular during expansionary periods.

Sample Hypothesis:

H_0: Songs popular during contractionary periods have the same dominant tones as the songs that are popular during expansionary periods.

H_1: Songs popular during contractionary periods have different dominant tones than the songs popular during expansionary periods

Methodology & Analysis

To narrow the scope of this research, I limited my analysis to the period of July 1990 through December 2010, which spans the course of 3 economic cycles and 1,064 weeks. This period was chosen to include consequent economic cycles within two decades, but was also cut off in December 2010 instead of present day to cap the number of songs collected and analyzed.

To conduct this research, I compiled the titles of all the top 1 Billboard songs in the US from 1990-2010, categorizing them into different economic periods and times (Contractionary 1-3, Expansionary 1-3). The top Billboard songs incorporate many components into their ranking system, including but not limited to "key fan interactions with music, including album sales and downloads, track downloads, radio airplay and touring as well as streaming and social interactions on Facebook, Twitter, Vevo, Youtube, Spotify and other popular online destinations for music" (Billboard). Thus, Billboard is a reliable source to understand what music is popular across the United States.

Then, I randomly selected 20 songs from each economic period (or all songs from the economic period if there were less than 20 songs in that period) for a total of 108 songs to analyze. From this list, I compiled the lyrics of those songs into a Word document, taking the lyrics from Genius. These lyrics were then cleaned for some spelling errors and removal of labels (Chorus, Verse 1, etc.).

Each individual song's lyrics were put through the Watson tone analyzer, which detected the overall tone of the song. The tones that were detected in each song were documented, as well as the scores related with those tones. Tones that were not present or

undetected were documented as a 0. Tones include “Anger”, “Fear”, “Joy”, “Sadness”, “Analytical”, “Confident”, and “Tentative”. Song lyrics were also analyzed in R for unique and total word count. From this data, I could compare and analyze each period to look for any relevant correlations.

To analyze the data, I utilized the data compiled into Excel to make comparisons between periods. In taking the averages of each tone for a certain period, I could make comparisons between the average tone scores for Contractions and Recessions. Similarly, I compared the periods with total and unique word count to look for any differences.

To check for statistical significance, I selected 4 tones that showed the largest percentage difference between expansionary and contractionary periods. Each of those four tones went through a 2-sample t-tests assuming equal variances with an alpha of 0.10. Given the results, I then made explanations as for why some tones came out as significant or non-significant.

Results

Contractionary Periods:

When looking at individual contractionary periods, we found that the most dominant tones in each of the three periods were Joy and Tentative. The first contractionary period's (July 1990 to February 1991) most dominant tone was Joy and Tentative. Relative to all other periods, however, this period showed more presence of Analytical and Fear. The second contractionary period (March 2001 to October 2001) was dominated by Joy. In relation to other periods, we found that it exhibited more tones of Confidence and Joy. The third contractionary period (December 2007 to May 2009) had more tones of Tentative, and in relation to other periods it also showed the most presence of Tentative emotions.

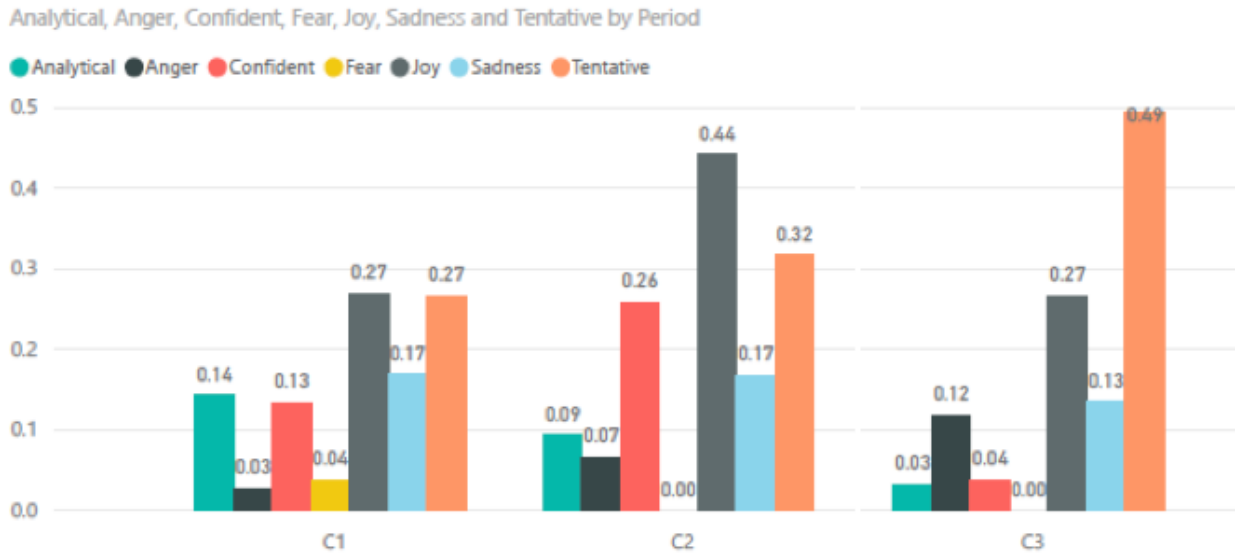

Figure 4. Comparison of Tones in Contractionary Periods

Expansionary Periods:

Expansionary periods, on the other hand, showed more negative emotions than expected. The first expansionary period (March 1991 to February 2001) contained mostly

Tentative tones. In relation to other periods it was also characterized by Tentativeness. The second expansionary period (November 201 to November 2006) had a large presence of both Sadness and Tentative tones. Relative to other periods, however, it demonstrated more Sadness and Anger emotions. Finally, the third expansionary period (June 2009 to December 2010) was characterized by Joy. However, in relation to other periods it showed more tones of Anger.

Figure 5. Comparison of Tones in Expansionary Periods

Overall:

In combining our results to compare expansionary and contractionary periods, I found that for both the most prevalent tones include Joy, Sadness, and Tentative. Rather than

focusing on the similarities, however, I wanted to highlight the differences between periods.

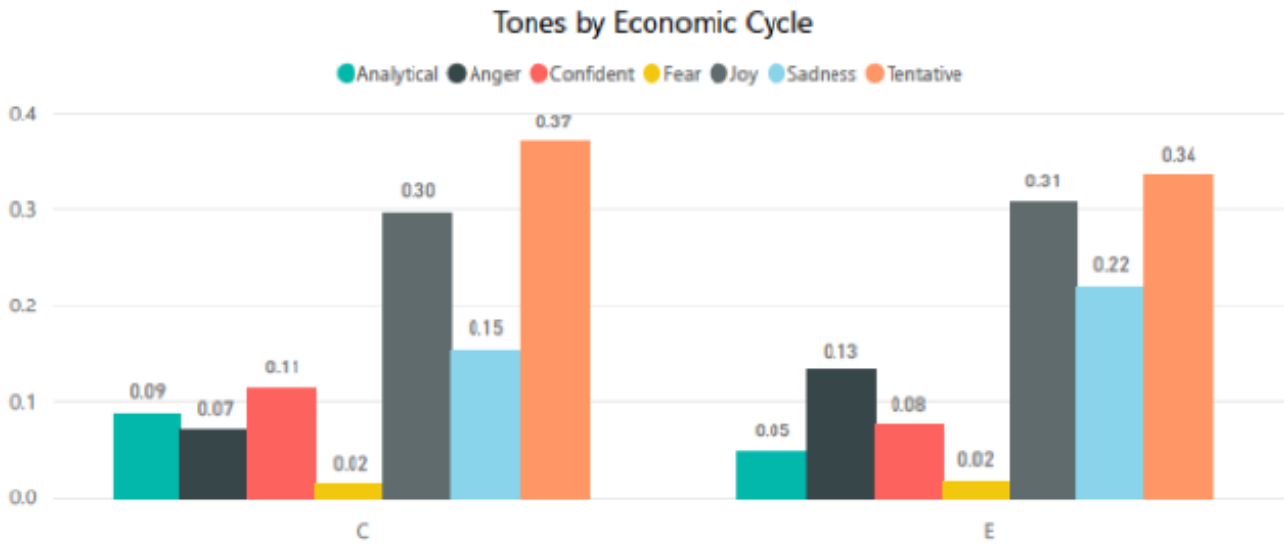

Figure 6. Comparison of Tones Between Periods

In this analysis, there was a difference in the tones found in economic contractions vs economic expansions. in times of economic contractions, song lyrics were more likely to exhibit analytical and confidence tones, while in economic expansions lyrics tend to show more tones of sadness and anger. Having more positive tones appear during times of economic contractions and more negative tones in times of economic expansions could be attributed to lagging effects of when songs were produced vs. released, as well as the lagging effects of consumer confidence and personal economic well-being.

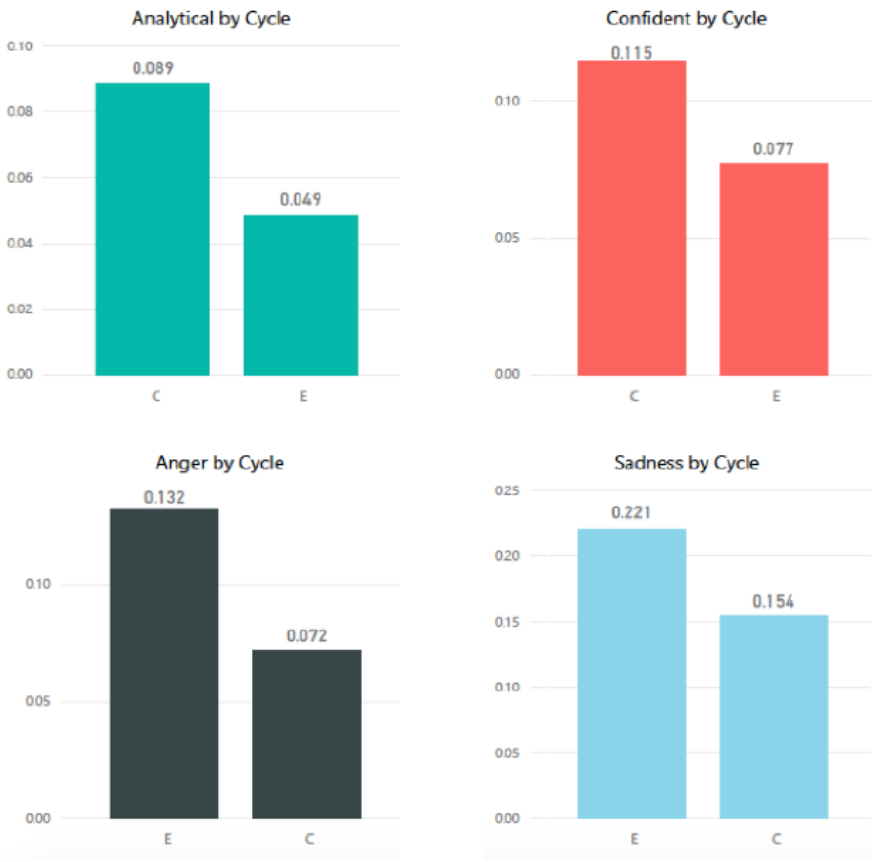

Figure 7. Differences in Tones Between Periods

Additionally, in analyzing the average unique and total word count of song lyrics in this era, I found that more contemporary music (2001-2010) has more unique and total words than music from 1990-2000. And while our analysis shows that economic expansions tend to have more word count than economic contractions, this may be due to overall trends over time rather than the impacts of the economic cycle.

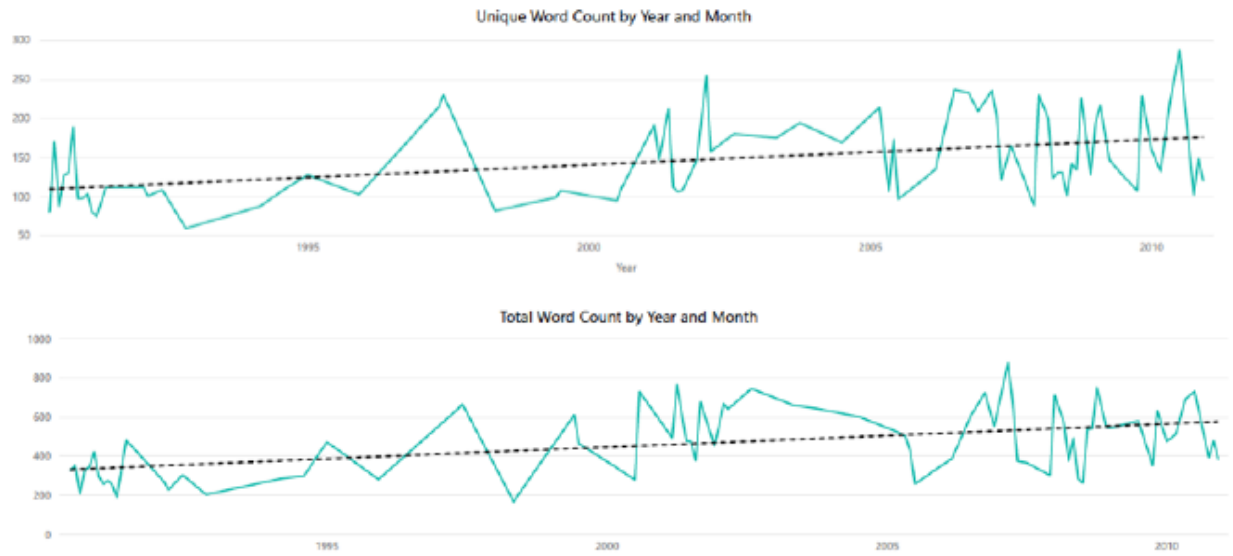

Figure 8. Word Count over the Years

Statistical Significance

To analyze Anger, Analytical, Sadness, and Confidence for statistical significance across expansionary and contractionary periods, I conducted 2-sample t-tests to check for differences in means for each of those four emotions. With an alpha of 0.10, we found that Anger, with a P-value of 0.09, was statistically significant. The other results did not pass the test of significance. However, the near-marginal results indicate that had we either increased our sample size or used a tone analyzer that detected the weights of non-dominant tones, we may have stronger evidence to support that expansionary periods exhibit more negative tones of anger and sadness, while contractionary periods showed more positive tones of analytical and confidence. Ultimately, while three of the four tones analyzed do not show statistical significance, our limitations in the type of tone analyzer and our sample size suggests that if future research accounts for these limitations, we may have stronger evidence for our results.

			Expansionary		Contractionary	
	P-Value	t Stat	Mean	Variance	Mean	Variance
Anger	0.08956	1.35239	0.13204	0.06545	0.07183	0.03705
Analytical	0.16383	-0.98337	0.04861	0.03380	0.08871	0.05756
Confidence	0.22598	-0.75492	0.07700	0.05459	0.11470	0.08145
Sadness	0.11701	1.19694	0.22090	0.08861	0.15411	0.07368

Table 3. Test of Statistical Significance

Discussion

Tones Prevalent in Both Periods

Across both periods, the most prevalent tones included Joy, Sadness, and Tentative. This makes sense when we consider the reasons why these tones are heavily used in songs. When thinking of song themes, most artists choose to write about love. Love, too, has various parts to be sung about. For instance, the joys of being in love. Or, the sadness in heartbreak over losing a loved one. Even tentative emotions of seeing if a love is reciprocated or not. We see this within our data set with songs like “Break Your Heart” by Taio Cruz, which is largely characterized by sadness. Or Bruno Mar’s “Just the Way You Are” that is largely characterized by joy (in knowing he has the perfect girl) and tentativeness (possibly in how he needs to convince the girl she’s perfect as she is). Ultimately, common tones of joy, sadness, and tentative are prevalent across both periods largely due to the popularity of songs about love.

Tone Differences Across Periods

As mentioned before, expansionary periods seemed to be more affiliated with negative emotions of anger and sadness, while contractionary periods exhibited more positive emotions of analytical and confidence. These seemingly contradictory findings may be attributed to lagging effects of financial well-being in society on one’s emotional health, as well as the desire to escape from one’s economic reality through popular music. While looking at consumer sentiment vs economic cycles, we find that there is not much of a leading nor lagging trend. However, other research, such as Diana Frasquilho and company’s “Mental health outcomes in times of economic recession: a systematic literature review,” reveals that there is a significant

relationship between negative emotional or mental health and periods of economic recessions. Thus, we have some reason to believe that people negatively affected by periods of recessions may listen to songs with more negative tones even in times of expansionary periods. Another article by Scott Timberg from Vox, "How music has responded to a decade of economic inequality," also suggests that people listen to songs that do not reflect their economic reality. "Popular music…becomes popular partly because it takes people away from their lives" (Timberg). Thus, in times of economic contractionary periods, it may make sense for society to want to listen to songs with more positive emotions in order to distract them from their current economic situation. While we cannot give a conclusive reason as to why there are more negative tones in expansionary periods and vice versa, we can at least make a reasonable guess as to why that may be the case.

Limitations in Research

As mentioned previously, of the four emotions tested for statistical significance, only anger had enough evidence (with an alpha of 0.10) to suggest that the tones were different across periods. However, the near-marginal results indicate that had we either increased our sample size or used a tone analyzer that detected the weights of non-dominant tones, we may have stronger evidence to support that expansionary periods exhibit more negative tones of anger and sadness, while contractionary periods showed more positive tones of analytical and confidence. Our current tone analyzer, IBM's Watson, only detects dominant tones found in text. It sets weights for those tones to be anywhere from 0.5 to 1. However, non-dominant tones in text could have tone weights of 0 to 0.49. Because we simplified and set non-dominant

tones to 0, our results could be more skewed due to this large variance. If another tone analyzer is capable of setting tone weights for non-dominant tones, we could have more significant results. Furthermore, because we limited our analysis to 3 economic cycles (108 songs), our sample size was not large enough to be statistically significant. If we increase our sample size to a longer time frame, we may be able to have more significant results. However, increasing sample size could also be more difficult to control for factors such as generational preferences or other external factors. Additionally, we would require changes in the data collection process to more efficiently collect, clean, and analyze song lyrics from an increased range of time. Ultimately, while three of the four tones analyzed do not show statistical significance, our limitations in the type of tone analyzer and our sample size suggests that if future research accounts for these limitations, we may have stronger evidence for our results.

Implications/Future Research

In terms of the implications of our research, our findings may be useful in both the music industry and in one's common life. Our analysis can help the music industry better understand why certain music is more popular in one period over another, which can help them decide when is the best time to release a song to match the public's sentiment. However, my hope for this research goes beyond making musical prediction analysis for the entertainment industry. In seeing how one's external circumstances—the economic environment—can be related to one's preferences in music, we can also begin to consider ways in which other external variables can affect who we are and why we like or do the things that we do.

Thus, the options to continue this research are inexhaustible. One could act upon the limitations of our research by developing and utilizing a different tone analyzer to detect non-dominant tones in text. Alternatively, one could also increase the period studied in this project, thus increasing the number of economic cycles to analyze. Or, one could add on to this research by incorporating the analysis of other songs elements, such as genre and artist. While our research suggests that there could be a relationship between economy and music, more research could be done into why or how something that seems unrelated to music can still be correlated to it. For example, looking into how our political environment affects the music we listen to—perhaps when looking at political parties in power over time. Or, one could look into generational changes in the music that we listen to across periods. Overall, there are a plethora of opportunities to increase the scope or extend this research in order to glean more information on how our external environment impacts or influences the music that our society listens to.

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Appendices

Tables:

Row Labels	Average of Joy Weight	Average of Analytical Weight	Average of Sadness Weight	Average of Fear Weight	Average of Tentative Weight	Average of Confident Weight	Average of Anger Weight
C1	0.26924345	0.14291735	0.169008421	0.037840211	0.26675115	0.13422375	0.0279212
C2	0.44100175	0.09377025	0.167040625	0	0.3171805	0.25796875	0.066839
C3	0.2663257	0.03247115	0.13477715	0	0.49401615	0.03785675	0.117732
E1	0.38712805	0.0353862	0.21975955	0.02617	0.4794133	0.08195985	0.02806525
E2	0.17854	0.07289235	0.26296105	0	0.280685	0.109236	0.1852931
E3	0.35717335	0.03755735	0.1799809	0.0282577	0.2489133	0.0397904	0.18275685

Table 1. Comparison of Tone Weight Averages Across Individual Periods

Row Labels	Average of Joy Weight	Average of Analytical Weight	Average of Sadness Weight	Average of Fear Weight	Average of Tentative Weight	Average of Confident Weight	Average of Anger Weight
C	0.296654104	**0.088706917**	0.154106979	0.015297106	**0.369849792**	**0.114695**	0.071828667
E	**0.3076138**	0.048611967	**0.2209005**	**0.018142567**	0.3363372	0.076995417	**0.1320384**

Table 2. Comparison of Tone Weight Averages Across All Periods

			Expansionary		*Contractionary*	
	P-Value	*t Stat*	*Mean*	*Variance*	*Mean*	*Variance*
Anger	0.08956	1.35239	0.13204	0.06545	0.07183	0.03705
Analytical	0.16383	-0.98337	0.04861	0.03380	0.08871	0.05756
Confidence	0.22598	-0.75492	0.07700	0.05459	0.11470	0.08145
Sadness	0.11701	1.19694	0.22090	0.08861	0.15411	0.07368

Table 3. Test of Statistical Significance

Figures:

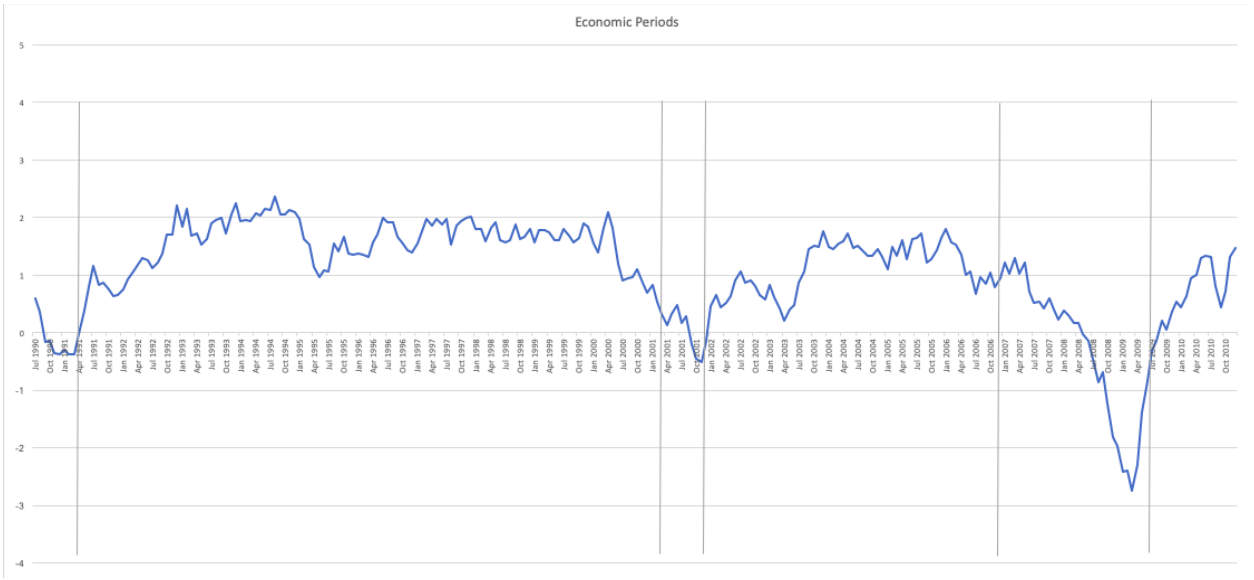

Figure 1. Economic Periods from 1990 to 2010

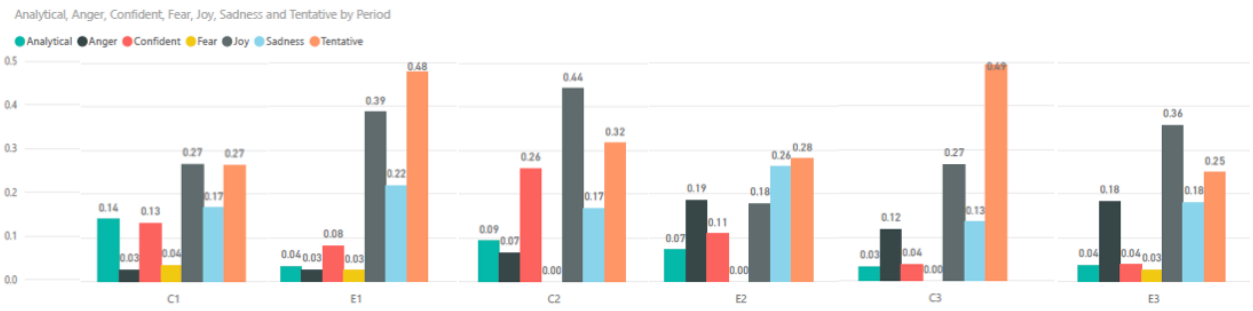

Figure 2. Chronological Order of Tones Across Individual Periods

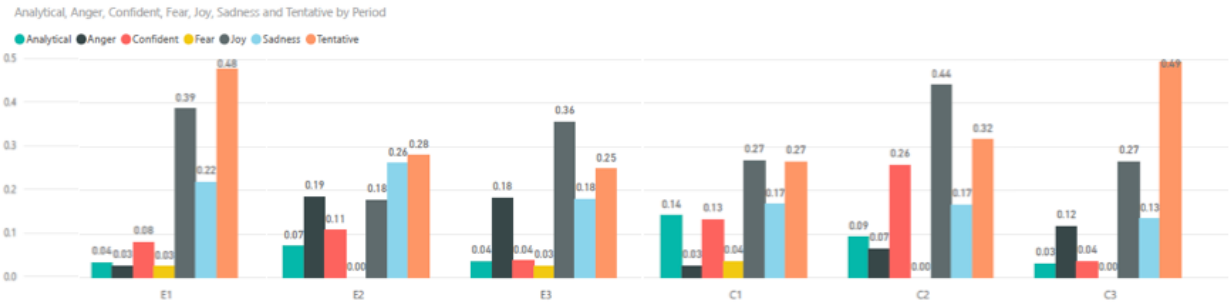

Figure 3. Tones Across Indivudal Periods

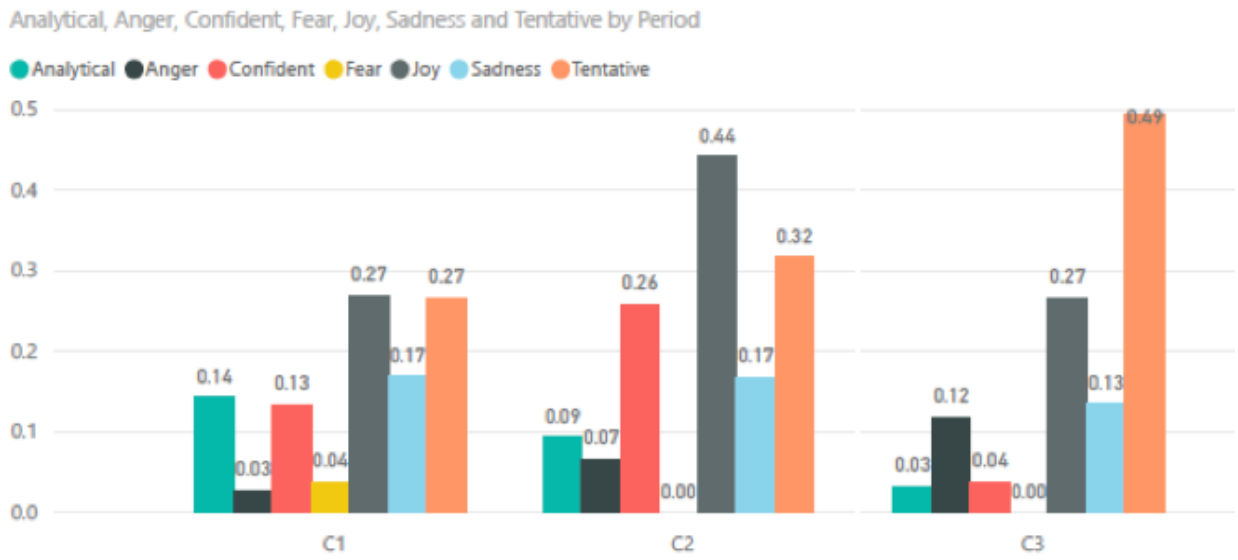

Figure 4. Comparison of Tones in Contractionary Periods

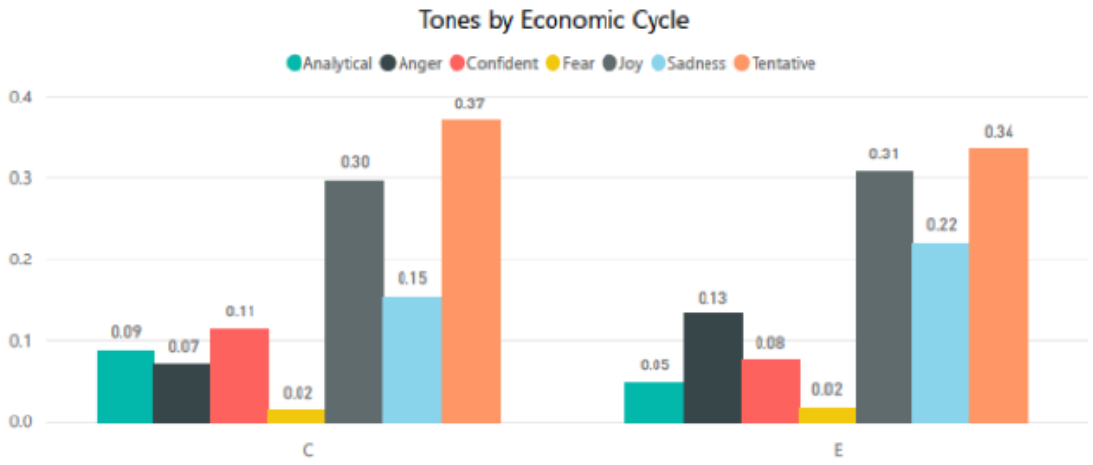

Figure 5. Comparison of Tones in Expansionary Periods

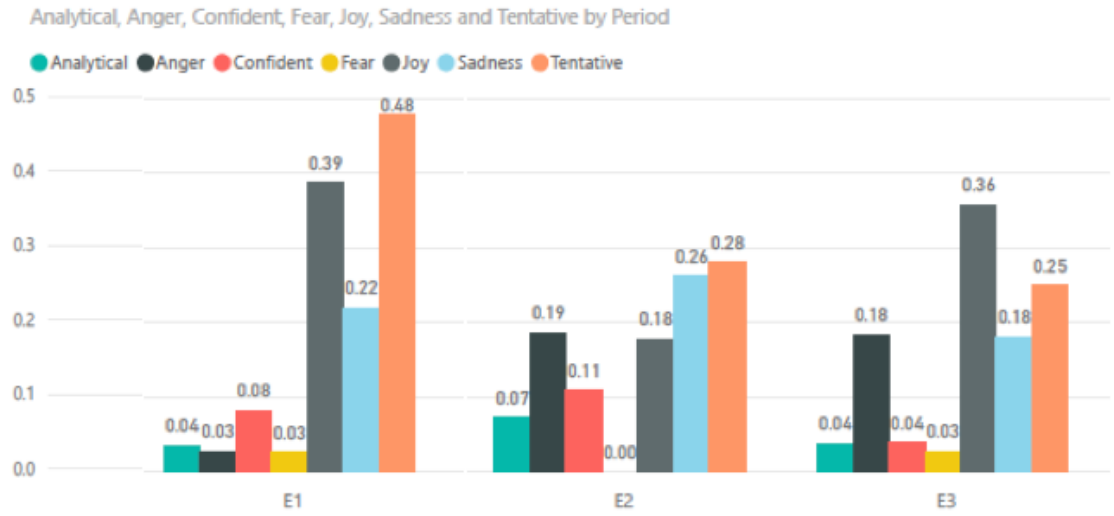

Figure 6. Comparison of Tones Between Periods

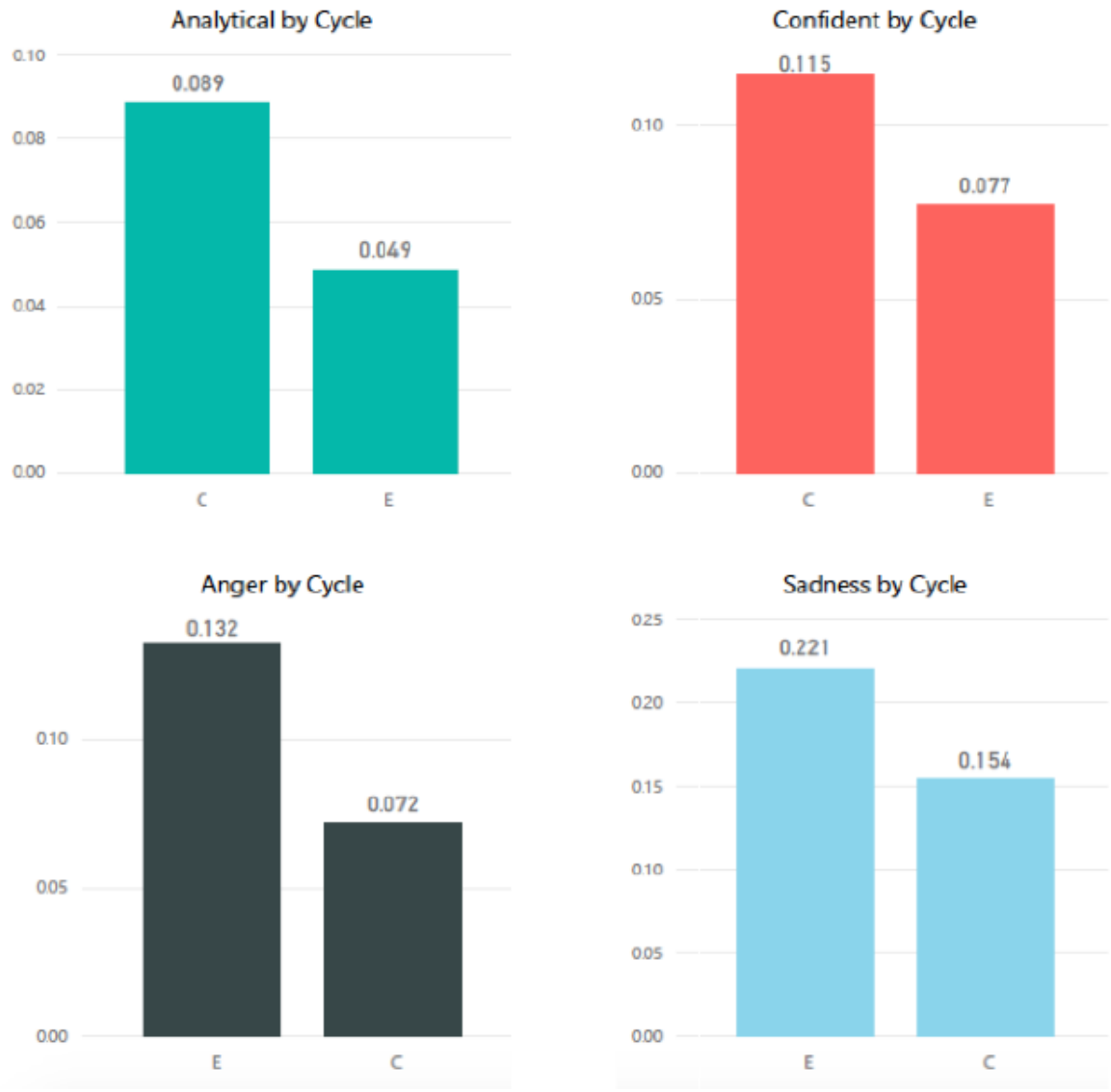

Figure 7. Differences in Tones Between Periods

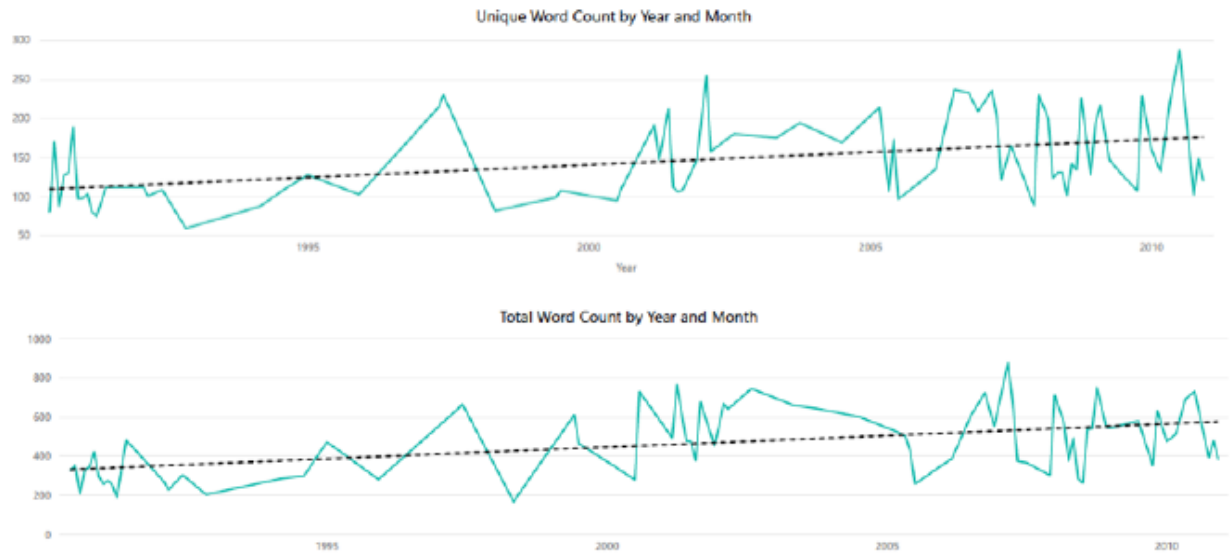

Figure 8. Word Count over the Years

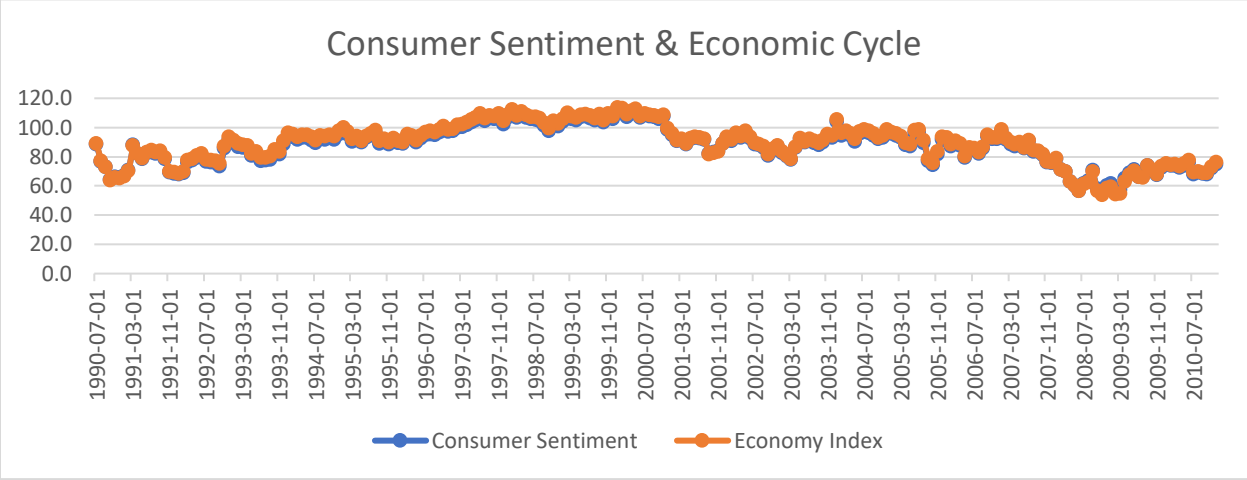

Figure 9. Consumer Sentiment and Economic Cycle Relation